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(72) DE BELLIS, Maria, CA
(71) DE BELLIS, Maria, CA

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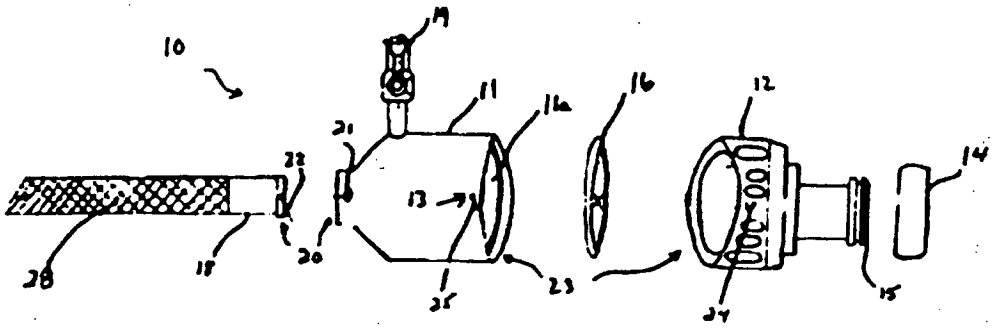
(54) ENSEMBLE DE TROCART REUTILISABLE
(54) REUSABLE TROCAR ASSEMBLY



(57) L'invention concerne un ensemble de trocart réutilisable combinant les propriétés optimales des trocarts réutilisables et jetables. L'invention comprend un ensemble de trocart réutilisable composé d'une portion manche dont l'ouverture est conçue de façon à définir un orifice d'entrée pour un instrument chirurgical adapté aux procédures de laparoscopie ou d'endoscopie, d'un ensemble de valve comprenant un membre tubulaire muni d'un premier dispositif de retenue pour valve; d'une portion boîtier muni d'un second dispositif de retenue pour valve; d'une valve de silicone qui s'insère et est maintenue dans les deux dispositifs de retenue pour valve; d'une canule définissant une lumière pour le passage dudit instrument chirurgical; et d'un dispositif désengageable pour fixer ladite canule audit boîtier et ledit boîtier audit ensemble de valve. Idéalement, les composantes (boîtier, ensemble de valve et canule) doivent être fixées au moyen d'un dispositif de type à baïonnette pour que l'on puisse les désengager pour nettoyer et remplacer les valves.

(57) The invention relates to a reusable trocar assembly which combines the optimal features of reusable and disposable trocars. The invention provides a reusable trocar assembly comprising a handle portion having an aperture suitably configured to define an entry port for a surgical instrument adapted for use in laparoscopic or endoscopic surgical procedures; a valve assembly comprising a tubular member having first valve retaining means; a housing portion having second valve retaining means; a silicone valve which engages and is retained by said first and second valve retaining means; a cannula defining a lumen for the passage of said surgical instrument; and attachment means for releasably securing said cannula to said housing and said housing to said valve assembly. Preferably, the components (housing, valve assembly and cannula) will be attachable by means of a bayonet-style mount, to permit easy disengagement of the components for cleaning and valve replacement.

REUSABLE TROCAR ASSEMBLY

ABSTRACT

The invention relates to a reusable trocar assembly which combines the optimal features of reusable and disposable trocars. The invention provides a reusable trocar assembly comprising a handle portion having an aperture suitably configured to define an entry port for a surgical instrument adapted for use in laparoscopic or endoscopic surgical procedures; a valve assembly comprising a tubular member having first valve retaining means; a housing portion having second valve retaining means; a silicone valve which engages and is retained by said first and second valve retaining means; a cannula defining a lumen for the passage of said surgical instrument; and attachment means for releasably securing said cannula to said housing and said housing to said valve assembly. Preferably, the components (housing, valve assembly and cannula) will be attachable by means of a bayonet-style mount, to permit easy disengagement of the components for cleaning and valve replacement.

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REUSABLE TROCAR ASSEMBLY

BACKGROUND TO THE INVENTION

The present invention relates to the field of reusable surgical instruments, and in particular to reusable trocars.

Laparoscopic or endoscopic techniques are now commonly used to perform a variety of surgical procedures. Such techniques enable invasive procedures to be performed without making a large incision in the skin and are performed with trocars which comprise an obturator and a cannula sub-assembly. Typically, a small puncture is made in the body cavity, and a cannula is inserted into the cavity through the small incision defined by the puncture. The cannula functions as a conduit through which instruments required to perform the surgical procedure can be introduced or withdrawn, as necessary. Particularly where the body cavity being operated upon is the abdomen, a quantity of insufflatory gas will be introduced into the cavity in order to distend it. Distension of the body cavity reduces the likelihood that the surgical instrument will be impeded by other internal structures during the course of the operation.

In the prior art, trocar devices are constructed to be either disposable or reusable. Disposable trocars have numerous advantages. They tend to be lightweight, and can be disposed after use without the necessity of cleaning and sterilization for subsequent use. Since trocars are typically comprised of several parts, disassembly and thorough cleaning of each

subcomponent is time intensive. Disposable trocars overcome this disadvantage, but are an expensive alternative, in a time of fiscal restraint within the hospital system, and general concern about minimizing environmental waste, since a new instrument must be used for each surgical procedure. Moreover, disposable trocars are frequently constructed of lightweight material which renders them insufficiently durable to withstand the forces incident on the trocar or its parts during surgical procedures. A significant force must frequently be exerted in making a puncture or incision of sufficient depth in the body cavity due to the resistance offered by several layers of tissue and internal fluid pressure within the body cavity.

Alternatively, there is the option of using a trocar which is reusable. Reusable trocars are typically constructed of stainless steel or other material of high tensile strength. However, reusable trocars tend to be heavy and somewhat awkward to use, because they typically include a fairly complicated valve assembly, which must be designed to withstand the rigours of repeated use occasioned by the passage of surgical instruments there through, while still maintaining a tight seal to prevent the escape of body fluids or insufflatory gas from the body cavity. To achieve this objective, reusable trocars typically feature sophisticated valve assemblies, such as spring or metal flapper valves. The valve is opened by the physical force or pressure of the surgical instrument impacting the valve. However, the durability of the valve construction frequently requires the application of considerable force to

cause the valve to open and permit passage of the surgical instrument. This can damage the surgical instrument. Further, the risk of trauma to the patient is increased, if the surgeon misjudges or overcompensates with respect to the degree of force needed to open the valve, since the instrument may be driven farther or deeper into the body cavity than necessary.

The prior art has attempted to address some of the drawbacks, but no one device has incorporated all of the advantageous elements of both reusable and disposable trocars into a single reusable instrument.

U.S. Patent 5,545,150 discloses a reusable trocar featuring a cannula with a knurled outer surface, an interfitting retractable obturator and a disposable flapper valve assembly.

U.S. Patent 5,397,335 discloses a trocar assembly having a plurality of adaptor seals positioned at the entry port of the trocar assembly to permit introduction of varying sizes of surgical instruments during a surgical procedure without withdrawing and interchanging the cannula.

U.S. Patent 5,290,245 discloses a trocar assembly featuring a hinged flapper valve seal with improved gasket means.

U.S. Patent 5,526,147 teaches a reusable trocar having an obturator with a replaceable tip.

U.S. Patent 5,242,412 provides a trocar featuring a unitary, self-sealing duckbill sealing valve comprising a supple tube of plastic or rubber with an integral retaining collar, which provides an improved seal arrangement to reduce the risk of gas or fluid leakage.

U.S. Patents 5,176,652 and 5,000,745 teach haemostasis valves featuring disk-like gaskets.

It is an object of the present invention to obviate and mitigate the disadvantages of the prior art by providing a reusable trocar assembly which combines the optimal features of reusable and disposable trocars.

Accordingly, in a broad aspect, the invention provides a reusable trocar assembly comprising a handle portion having an aperture suitably configured to define an entry port for a surgical instrument adapted for use in laparoscopic or endoscopic surgical procedures; a valve assembly comprising a tubular member having first valve retaining means; a housing portion having second valve retaining means; a silicone valve which engages and is retained by said first and second valve retaining means; a cannula defining a lumen for the passage of said surgical instrument; and attachment means for releasably securing said cannula to said housing and said housing to said valve assembly. Preferably, the components (housing, valve assembly and cannula) will be attachable by means of a bayonet-style mount, to permit easy disassembly of the trocar for

cleaning and valve replacement. Most preferably, the components will be constructed from titanium.

An obturator is receivable within the lumen defined by the valve assembly, housing and cannula when the components are assembled. Preferably, the obturator will have removable, screw-threaded tips.

The features and advantages of the invention will now be described with reference to the accompanying drawings, wherein:

Figure 1 is an exploded side view of the components of the trocar assembly of the present invention.

Figure 2 is a front view of the housing of the trocar assembly of the present invention.

Figure 3 is a front view of the valve used in the trocar assembly of the present invention.

Figure 4 is a front view of the valve assembly of the trocar assembly of the present invention.

Figure 5 is a side view of the obturator used in the present invention.

Figure 6A is a side view of an obturator tip which may be used in accordance with the present invention.

Figure 6B is a side view of an obturator tip which may be used in accordance with the present invention.

The trocar assembly is indicated generally as 10 and comprises a housing 11 which defines an interior lumen 11a. Valve assembly 12 is detachably secured to housing 11 by attachment means 13. A handle portion 14 is removably secured to the valve assembly, such as by means of screw threads 15.

Cannula 18 is attachable to housing 11. Housing 11 may also be provided with a stopcock 19 or other similar fluid or gas control device to permit insufflatory gas to be introduced or removed from the body cavity.

Preferably, cannula 18 is attached to housing 11 by means of bayonet-style mount 20 which comprises hook 21 and pin 22. Another bayonet-style mount 23, comprising hook 24 and pin 25, may be used to attach housing 11 to valve assembly 12. It will be appreciated by those skilled in the art that a plurality of bayonet mounts 20, 23 may be disposed along the circumference of housing 11 and valve assembly 12, in order to provide a more secure means for attaching and securing the components of the trocar assembly, while enabling all or some of the components of the assembly to be quickly and easily disassembled, as necessary.

Housing 11, valve assembly 12 and cannula 18 are preferably constructed from titanium, or any similar material or alloy which is lightweight, durable, and has tensile strength.

Obturator tube 26 is receivable within the lumen defined when housing 11, and valve assembly 12 are secured together. It will be understood by those skilled in the art that handle portion 14 has a central aperture (not shown) which serves as an entry port for obturator 26 or any other surgical instrument which is desired to be introduced into the cannula 18.

It will be further understood by those skilled in the art that incision tools or tips of different configuration may be needed for different types of incisions, depending upon the type of surgical procedure which is being performed. Accordingly, obturator tube 26 of the present invention is adapted to accommodate incision tools of different configuration. Obturator tube 26 is equipped with internal screw threads 27 which receive and secure complementary screw threads on obturator tips 29 or 30. This feature allows the obturator tips to be easily replaced as needed. Since the obturator tips must be sharp, the use of replaceable tips eliminates the need for resharpening and resterilization of dull blades or tips, while enabling the obturator tool to be reused. This feature also allows the instrument to be adapted for use in a variety of surgical procedures. Preferably, the obturator and obturator tips will be manufactured from titanium, stainless steel, brass

chrome plate or other suitable material well known to those skilled in the art.

A valve 16 is seated within housing 11 and valve assembly 12. Valve 16 must provide a tight seal to prevent loss of fluids or gas from the body cavity. Accordingly, the interior wall of housing 11 has an annular lip or shoulder 17 to retain valve 16. A complementary annular lip or shoulder 18 is present within valve assembly 12, such that valve 16 rests on lips 16, 17 and is tightly retained in place when the housing and valve assembly are secured together. Those skilled in the art will appreciate that other sealing means such as O-rings or sealing rings may optionally be included in order to provide improved sealing, as necessary.

Valve 16 is preferably constructed of pure silicone. The diaphragm 16a of the valve is scored or perforated in a cross-like pattern, or other suitable shape, which define a plurality of flaps 19. When a surgical instrument passes through the valve, it is retained by the frictional and resistive forces defined by the partial deflection of flaps 19, while preventing backflow of gas or fluids from the body cavity.

Conventional trocars use valves made of steel or other relatively heavy material in order to obtain a relatively airtight seal. However, such conventional valve mechanisms are heavy, relative to the overall weight of the trocar. Since the valve is located near the top of the trocar, the weight of the

valve can cause the trocar to list or tilt to one side when inserted in the body cavity, which can lead to inadvertent displacement of the cannula or tearing of the incision. The use of lightweight silicone valve 16 eliminates the top heaviness of the trocar due to the weight of valve mechanism and therefore reduces the tendency of the trocar to list to one side. Silicone valve 16 also simplifies the process of cleaning and sterilizing the trocar for re-use, since the multiple moving parts of conventional metal valves are eliminated in favour of the simple, one piece lightweight construction of silicone valve 16. Valve 16 may therefore be easily and conveniently replaced as required, without the necessity for replacing the entire instrument.

The outer surface of cannula 18 may be roughened as shown by cross-hatching 28 or otherwise treated in such a manner such that frictional forces are created which tend to prevent slippage of cannula 18 within the incision in the body cavity which may occur due to contact with bodily fluids released upon making of an incision in the body cavity.

In use, the components of the assembly, namely housing 11, valve assembly 12 and cannula 18 are securely attached to one another by means of bayonet-style mounts 20, 23. Obturator tube 26 having an incision tool such as 28 or 29 secured to the end thereof is received through the aperture (not shown) in handle 14, and passes through valve assembly 12, deflecting flaps 19 of valve 16. The tip 28 or 29 of the obturator extends

through an exit port 27 defined by the lumen of the cannula and then punctures or incises the body cavity (not shown). Cannula 18 is inserted in the incision or puncture thus formed and is held in place, essentially perpendicular to the surface being incised, by the dimensions of the puncture or incision and frictional forces, aided by surface treatment of the cannula outer surface 28. Obturator 26 is then withdrawn, and one or more surgical instruments required to perform the surgical procedure can be introduced and removed successively from the cannula.

Upon completion of the surgical procedure, the individual components of the trocar assembly can be readily disassembled for cleaning and subsequent reassembly and reuse. The only component which will require frequent replacement is valve 16, which is easily removed and replaced. It will be understood by those skilled in the art that the use of bayonet style mounts enables components of different trocars to be used interchangeably, if necessary or desirable, to facilitate use of different surgical instruments of different dimensions.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A reusable trocar assembly comprising a handle portion having an aperture suitably configured to define an entry port for a surgical instrument adapted for use in laparoscopic or endoscopic surgical procedures; a valve assembly comprising a tubular member having first valve retaining means; a housing portion having second valve retaining means; a silicone valve which engages and is retained by said first and second valve retaining means; a cannula defining a lumen for the passage of said surgical instrument; and attachment means for releasably securing said cannula to said housing and said housing to said valve assembly.

2. The trocar assembly of claim 1 wherein said attachment means comprise a bayonet-style mount.

3. The trocar assembly of claim 1 wherein said first valve retaining means comprises an annular lip which extends from the interior wall of said valve assembly.

4. The trocar assembly of claim 1 wherein said second valve retaining means comprises an annular lip which extends from the interior wall of said housing.

5. The trocar assembly of claim 1 wherein said handle is detachable from said valve assembly.

6. The trocar assembly of claim 1 further comprising an obturator.

7. The trocar assembly of claim 6 wherein said obturator is a tubular member having an end portion which defines means for making a puncture or incision, and said end portion is detachably secured to said obturator tubular member.

8. The trocar assembly of claim 1 wherein the outer surface perimeter of said cannula has a roughened or textured surface.

9. The trocar assembly of claim 1 or 2 wherein said housing, said cannula and said valve assembly are constructed of titanium.

10. The trocar assembly of claim 1 wherein said housing further comprises a stopcock.

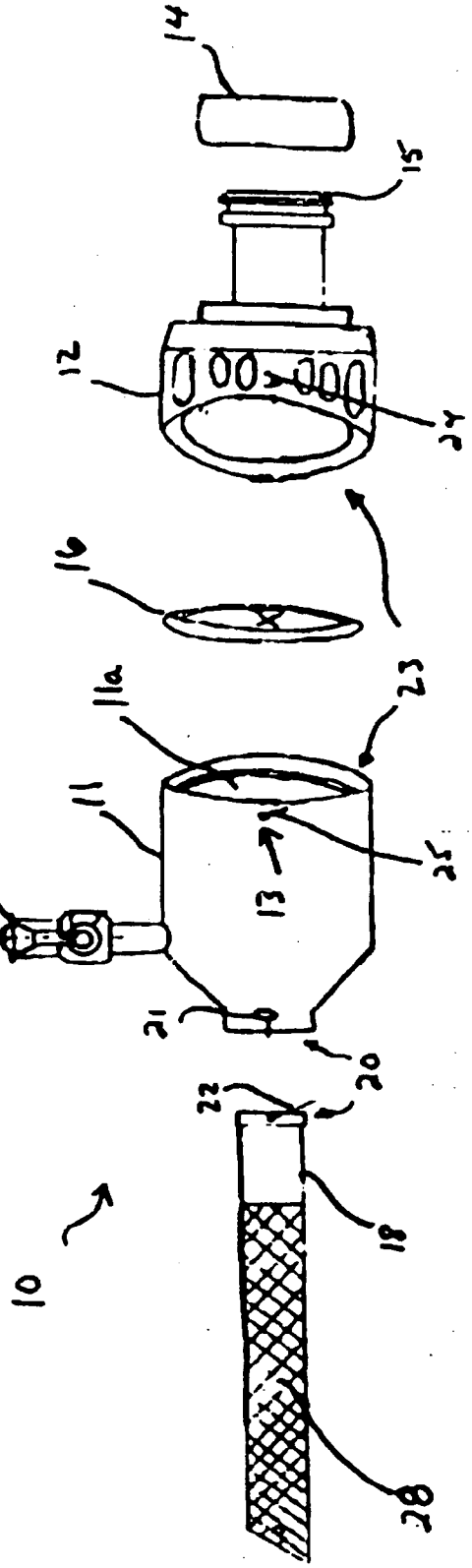


FIG. 1

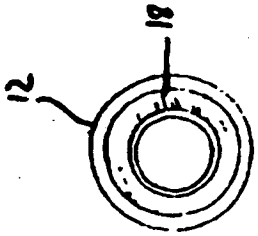


FIG 4

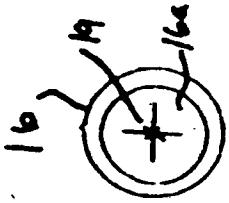


FIG 3

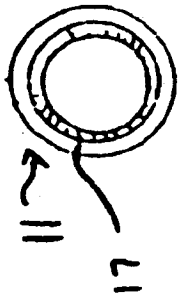
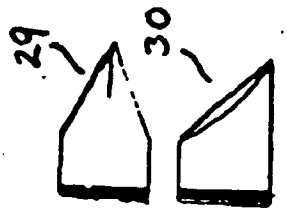


FIG 2

FIG. 6A

FIG. 6B



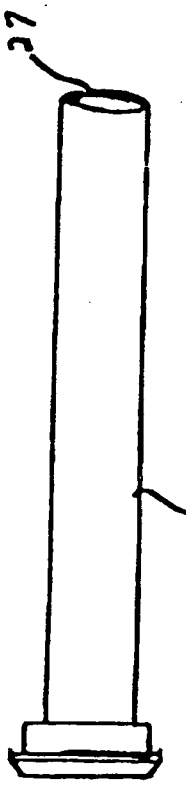


FIG. 5